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MEMORANDUM TO: Chief, CIA/PID (NPIC)

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ATTENTION : [redacted]

FROM : Acting Chief, PID/IB

SUBJECT : Advantages of Stereoscopy in Satellite Photography

The purpose of this memorandum is to present a case for the advantages of stereo photographic coverage over non-stereo coverage in the present satallite photography and in the development of future satellite photographic systems. However, statements presented herein are based on KEYHOLE photographic systems as we know them and are utilizing at the present time at NPIC, and do not attempt to speculate on the development of new types of systems. For the sake of convenience the memorandum is divided into two parts. Part One deals with the overall advantages of stereo over non-stereo coverage and Part Two lists specific cases where personnel in PID/IB have found stereo coverage to be a definite asset in performing PI analyses from satellite photography.

PART ONE

Time and time again the depth perception that is obtained through the stereo capability we now have in the present KEYHOLE photography has been beneficial and a very effective tool in the analysis of this photography. This holds true not only for a detailed analysis of specific installations or areas that are imaged on the photography, but also for the primary readout or "OAK" type of reporting. With the stereo capability a more thorough evaluation can be made of these installations or areas. The following is a list of advantages that PID/IB has found in this stereo capability:

1. Image enhancement. Stereo viewing enhances the quality of the image as presented on the photography and therefore many installations and items can be more readily identified. It can be argued that this also holds true for pseudo-stereo where two identical copies of the same photograph are viewed under a stereoscope, however the image enhancement is generally much better when viewed under true stereo.

2. Edge Definition. Stereo more clearly defines the photo image being viewed. Not only is edge definition enhanced, but also radial displacement and distortion due to relief is over come to a large degree.

3. Depth Perception. The perception of depth in stereo viewing is a definite asset in a detailed analysis. Even with the extremely small scale of the present KEYHOLE photography this depth perception has been used to advantage in identifying an installation or its integral components and in determing the specific purpose they serve. PID/IB has found this very useful not only in determing relative heights of the various components of an industrial installation, but also in obtaining overall height measurements of various buildings in an industrial plant which have been specifically asked for in some of our requirements. We have also found depth perception of value in analysing activity at mining areas and in analysing construction activity at industrial complexes.

4. Tone and Shadows. Often in satellite photography there is a lack of tone and definite shadows, both of which are often good identification features. Stereo capability helps to compensate for this deficiency.

5. Single Camera vs. Dual Cameras. KEYHOLE Missions 9009-9031 employed a single camera which provided little or no overlap between frames. Stereo was utilized when it was available on these areas of overlap, otherwise the PI analysts had to resort to pseudo-stereo for image enhancement. The foreward and aft camera set-up in KEYHOLE Missions 9032-9050 is, of course, designed for a stereo capability. However, there are advantages of this dual camera system that have come along as a definite by-product. In areas of extremes in local relief, these relief features or their shadows have obscured installations or items of interest on one camera but can often be found and analysed on the other camera. Also, with the two camera system, when there has been a malfunction in one of the cameras, the other camera has usually provided us with good quality photography.

PART TWO

The PI analysts in PID/IB use the stereo in practically all detailed studies worked from KEYHOLE missions on which this capability has been available. The following are specific cases in which we found the stereo capability to be of a definite advantage:

1. Presently in the Industrial Branch we have requirements requesting detailed photo analysis of several of the major oil refineries in the USSR. On some of these refineries satellite photography is the only coverage available, and the stereo KEYHOLE coverage has been definitely proven to be more advantageous over the non-stereo coverage in identifying many of the primary and secondary units in these refineries.

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